



THE POTATO TUBER WORM

Prepared by the Division of Truck Crop and Garden
Insect Investigations

The information on the potato tuber worm (moth) (Gnorimoschema operculella (Zell.)) presented here includes a description of its various stages, its life history, and the plant injury that it causes, together with notes on other insects, or their injuries, found on the same hosts.

Host Plants

Hosts of the potato tuber worm include potato, tobacco, jimsonweed (Datura stramonium L.), eggplant, horsetail (Solanum carolinense L.) tomato, pepper, and nightshade (S. xanthii Gray). Larvae of the potato tuber worm feed as leaf miners in all these hosts and also attack the potato tubers and tomato fruits. On tobacco this insect is called the splitworm.

Character of Injury

Injury on potato by the potato tuber worm is of two types. (1) as it mines the leaves, petioles, and stems of the growing plant, and (2) as it tunnels into the tubers, either in the field or in storage. A single larva may injure one-half to two-thirds of a leaflet in mining, or it may enter the petioles and stem when partly grown (fig. 1). The parts beyond the point of feeding in stems or petioles usually die. Tuber-feeding larvae tunnel through the potatoes, so filling these tunnels with excrement, on which fungi grow, that the potatoes are unsightly and of little food value (fig. 2). A larva usually enters the tuber near an eye, covering the small entrance hole with a web and excrement, so these holes are inconspicuous. A pink coloration developing in the flesh surrounding the entrance and additional excrement make the presence of the larvae more evident within a few days. Galleries from 1 to 3 inches in length may be cut by a single larva, either just beneath the skin or deep in the flesh.

Injury on tomato foliage is similar to that described on potato foliage, and the tomato fruits are also attacked. The varieties of tomato with firm, solid flesh and growing on plants with sparse, open foliage appear to be most readily attacked. The larvae usually enter the tomato fruits at the stem end, although occasionally entry is made at other points.

Injury to tobacco consists principally of leaf mining, although the tuber worm often tunnels the midrib or a vein in addition to mining the membrane of the leaf. Ordinarily only the older tobacco leaves are affected, unless the infestation is very severe. In these older leaves the leaf mines take the form of grayish, irregular blotches, which later turn brown and become fragile, so the affected leaves are unfit for use.

Comparison of Potato Tuber Worm and Tobacco Splitworm

Experiments performed by Morgan and Crumb¹ to determine the specific status of the potato tuber worm and the tobacco splitworm disclosed the following pertinent information: (1) Larvae of the potato tuber worm, of the habitual potato-feeding type, could be reared to maturity on potato tubers and on the foliage of tobacco, eggplant, horseradish, jimsonweed, ground cherry (Physalis sp.), and black nightshade (Solanum nigrum L.). Larvae of the tobacco splitworm, of the habitual tobacco-feeding type, were reared to maturity on the same host plants mentioned for the habitual potato-feeding type. (2) A female of the tobacco-feeding type, when mated with a male of the potato-feeding type, reared from isolated pupae, produced larvae that reached maturity upon tobacco. (3) The larva from potato is larger than the larva from tobacco, gray in general color, with a pink mesothorax and metathorax, while the habitual tobacco feeder is green in general color, with a deep maroon mesothorax and metathorax. By reversing the two food plants the larvae can be made to approach each other in coloration, but even after two generations on tobacco the habitual potato feeder is less green and has the thorax distinctly paler than the habitual tobacco feeder; also, when reared upon potato tubers, the coloration of the latter form persists. In the opinion of the investigators this rather persistent color variation in the two larval types is not of sufficient importance to justify a specific separation. (4) Adults of the potato tuber worm reared from potato tubers, tobacco, horseradish, jimsonweed, and ground cherry, and adults of the tobacco splitworm reared from tobacco, potato tubers, and ground cherry were submitted to August Busck, of this Bureau, who reported that he could find no specific differences.

Description of Stages

Egg: The egg is approximately 0.48 mm. long (1/50 of an inch). When freshly deposited it is opaque and pearly white in color, changing to a yellowish color as it becomes older.

¹See list of literature consulted.

Larva: The larva when full-grown ranges from $\frac{3}{8}$ to $\frac{1}{2}$ inch in length and may be pink, green, white, or pale yellow, with a dark-brown head and prothoracic shield. As discussed in a preceding paragraph of this circular, the species of food plant eaten by the larva apparently has an effect upon its color, although the actual color of the food plant does not necessarily influence the color of the larva.

Pupa: The pupa is approximately $\frac{1}{3}$ inch in length and spindle-shaped. It is usually found within a white silken cocoon. When first formed the pupa is white and bears green markings, but it soon changes to a uniform pale or dark-brown color. The cocoon containing the pupa is usually conspicuous unless concealed or discolored by dust or dirt.

Adult: The adult is a small moth, approximately $\frac{3}{8}$ to $\frac{1}{2}$ inch in length and with a wing expanse of approximately $\frac{1}{2}$ inch. The females are slightly larger than the males. The adult has a silver-colored body and bears minute black spots on the gray, fringed forewings.

Life History and Habits

The adults are weak fliers, and when disturbed in the field during the day they dart from plant to plant. They are much more active, however, during the prevalence of the dim light of evening or early morning than during periods of bright sunlight. Each female deposits from 150 to 200 eggs, on an average. These eggs are usually deposited on some rough surface, such as on the lower surface of the leaves of the host plant adjacent to a large vein or other rough tissue, or in the eyes of potato tubers left exposed in the field. During the storage period the eggs may be deposited on the potato tubers and on the covers of the barrels containing the tubers.

When the larva reaches full growth it usually deserts its host-plant leaf or tuber in preparation for pupation. In the field most of the larvae pupate in the soil. In storage they pupate, within their cocoons, in such situations as in and around the eyes of potato tubers in crevices of barrels or storage bins, or on burlap sacks or barrel coverings.

A generation of the potato tuber worm may be completed within a period of 13 days in midsummer but may require as long as approximately 7 months during the cooler period of the year.

Infestations of tuber worms may build up in areas where cull potatoes are allowed to remain in the field following the harvesting of the spring crop. Volunteer potato plants and solanaceous weeds also serve as sources of infestation for an outbreak of this insect, especially if a second crop of potatoes is grown on or near the same field.

The tuber worms gain entrance to the tubers near the surface of the ground by entering cracks in the soil. Tubers covered with at least 1 inch of soil are not subject to infestation. When the tubers are exposed at harvest time they may become infested by larvae or egg-laying adults.

moving from the tops. The larvae move quickly from the dying potato plant and may crawl some distance to the tubers.

The tuber worms overwinter successfully in potatoes that are not subjected to freezing temperature and consequently may develop in some areas in cull dumps and in storage houses and cellars, which serve as sources of early-season field infestation on volunteer plants or the newly planted crop. They also winter successfully in seed and market potatoes held in storage from fall to spring and may even develop through one or more generations during that period, depending upon the temperature.

The insect apparently does not build up to large numbers while it is breeding as a leaf miner in the growing potato tops. The greatest populations develop in tubers, where food is abundant and temperatures are favorable.

Other Insects

The tomato pinworm (Keiferia lycopersicella Busck) may be encountered with the potato tuber worm on tomato, potato, nightshade, and horsenettle. The mature larvae are about 1/4 inch long, and, at a glance, are a grayish purple, darker than the larger, lighter colored larvae of the potato tuber worm.

The eggplant leaf miner (Gnorimoschema glochinella Zell.) may be confused with the tuber worm, as the larva occurs in leaves of horsenettle and eggplant, but it may be distinguished by the character of its mine. The eggplant leaf miner usually begins its mine at the outer margin of the leaf and works toward the midrib. From one to five larvae may occur in one mine, and each larva forms a firm, silk-lined tube. The potato tuber worm larva begins its mine near the midrib, and usually only one larva occurs in each mine, which is not lined with silk.

Corn earworm larvae may enter the stem end of tomato fruits or through the side of two contiguous fruits. These may be distinguished from the potato tuber worm larvae by the large cavity eaten in the core and pulp and also by their large size and brown or greenish stripes.

Wireworms make a clean-cut, slender, rounded hole in the sides of growing potato tubers, which may become filled with corky tissue due to action of the potato scab organism.

Gnat larvae usually feed in areas injured by scab or other pests. They cause cavities 1/4 inch or more deep, filled with dark pellets of excrement, leaving a papery epidermis that tears irregularly.

Millipeds and white grubs attack growing tubers, leaving large, shallow, open cavities with no overhanging skin, while injury by slugs is characterized by most of the skin being left over the injured part.

Flea beetle larvae feed on the surface or penetrate 1/4 inch into the potato, leaving roughened, pimply scars

Literature consulted

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Figure 1.—Typical injury by the potato tuber worm to potato plants, showing mines in leaves, petioles, and stem. The potato tuber worm larva begins its mine near the midrib of the leaf, and usually only one larva occurs in each mine. This mine is not lined with silk. In contrast, the eggplant leaf miner usually begins its mine at the outer margin of the leaf and works toward the midrib. From 1 to 5 eggplant leaf miners may occur in one mine, and each larva forms a firm, silk-lined tube.

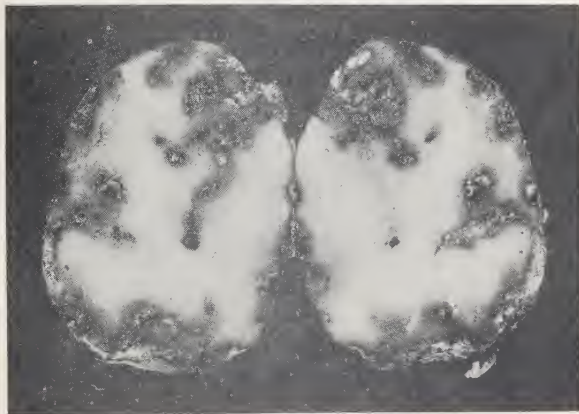


Figure 2.—Potato tuber cut open to show typical injury by the potato tuber worm. The tunnels made by the larva in the tuber are filled with excrement. The larva usually enters the tuber near an eye, covering the small entrance hole with a web and excrement, so these holes are inconspicuous.

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